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REMARKS

Claims 1 - 32 are pending in the present Application. No claims have been canceled or amended, leaving Claims 1 - 32 for consideration upon entry of the present response. Reconsideration and allowance of the claims is respectfully requested in view of the following remarks.

Claim Rejections Under 35 U.S.C. § 103(a)

Claims 1 - 32 stand rejected under 35 U.S.C. § 103(a), as allegedly unpatentable over U. S. Patent 6,536,284 to Bonanni in view of U. S. Patent 6,532,433 to Bharadwaj et al. (Bharadwaj). (Office Action dated November 21, 2003, Page 2)

Applicants respectfully traverse this rejection on the grounds that Bonanni has a common assignee with the instant application. Applicants have enclosed a copy of the assignment to demonstrate that the inventions were at the time the invention was made, subject to an obligation of assignment to the same entity. Applicants respectfully request a withdrawal of the § 103 rejection and an allowance of the claims over Bonanni in view of Bharadwaj.

Claims 1, 5, 11 and 32 are rejected under 35 U.S.C. § 103(a) as being allegedly unpatentable over U.S. Patent No. 6,231,306 to Khalid in view of U.S. Patent No. 5,894,473 to Dent. (Office Action dated November 21, 2003, Page 6)

In making the rejection, the Examiner has stated that "[i]t would have been obvious to one of ordinary skill in the art at the time the invention was made to include a frequency demodulator 128 and a Kalman filter as taught by Dent in a control system for preventing a compressor stall in a gas turbine engine of Khalid for purposes of providing the information signals to be transmitted over a common frequency spectrum (Dent, Abstract)." (Office Action dated November 21, 2003, Page 7)

Applicants traverse the rejection on the grounds that the Examiner has not made a prima facie case of obviousness over Khalid in view of Dent. For an obviousness rejection to be proper, the Examiner must meet the burden of establishing a *prima facie* case of obviousness, i.e., that all elements of the invention are disclosed in the prior art; that the prior

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art relied upon, coupled with knowledge generally available in the art at the time of the invention, contain some suggestion or incentive that would have motivated the skilled artisan to modify a reference or combined references; and that the proposed modification of the prior art had a reasonable expectation of success, determined from the vantage point of the skilled artisan at the time the invention was made. *In re Fine*, 5 U.S.P.Q.2d 1596, 1598 (Fed. Cir. 1988); *In Re Wilson*, 165 U.S.P.Q. 494, 496 (C.C.P.A. 1970); *Amgen v. Chugai Pharmaceuticals Co.*, 927 U.S.P.Q.2d, 1016, 1023 (Fed. Cir. 1996).

The present invention is directed at and claims a method for detecting precursors to compressor stall/surge, the method comprising monitoring at least one compressor parameter to obtain raw data representative of the at least one compressor parameter; pre-processing the raw data using a frequency demodulator to produce pre-processed data; post-processing the pre-processed data using a Kalman filter to obtain stall precursors. (Claim 1)

Khalid teaches a control system for preventing a compressor stall in a gas turbine engine includes means for sensing an aerodynamic signal indicative of an impending stall condition. (see Abstract) As accurately pointed out by the Examiner, Khalid does not teach the use of a frequency demodulator for producing demodulated data and further does not teach the use of a Kalman filter. (Office Action dated November 21, 2003, Page 6) Khalid, therefore does not teach all elements of the claimed invention.

Dent teaches a multiple access communication system and method using Code Division Multiple Access (CDMA) and Time Division Multiple Access (TDMA) comprises coding information signals with CDMA codewords to be transmitted over a common frequency spectrum, time compressing the CDMA codewords for transmission only during allocated timeslots, activating a receiver only during the allocated timeslots to receive and decompress the time compressed CDMA codewords and decoding the decompressed CDMA codewords to recover the information signals. (see Abstract) Dent teaches that the multiple access communication system using the CDMA and TDMA is applied to frequencies in the radio frequency regime of the electromagnetic spectrum. (see Col. 7, lines 16 – 20; Col. 7, lines 37 – 42).

In the first instance, it is submitted that there is no motivation to combine Dent with Khalid in the manner combined by the Examiner. Neither Khalid nor Dent provides any

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motivation to combine one with the other. Khalid mentions neither frequency demodulation nor filtering with a Kalman filter as a possible method to obtain stall precursors in the compressor. One of ordinary skill in the art upon reading Khalid would therefore find no need to search for the frequency demodulator and the Kalman filter from Dent, which is directed at communications-based applications, and apply these components to a compressor used in a gas turbine for purposes of power generation. Further, one of ordinary skill in the art upon reading Dent would, similarly, find no motivation to combine Dent with Khalid. Dent neither teaches nor suggests combining the frequency demodulator and Kalman filter from a multiple access communication system with a compressor that is used for the generation of power.

In addition, it is submitted that Dent is not from an analogous field of art. The present invention is related to the field of power generation. Dent, on the other hand, is directed at multiple access communication systems using Code Division Multiple Access (CDMA) and Time Division Multiple Access (TDMA), which are commonly used in cell-phones and the like. (see Abstract) Dent is therefore not from the same field of endeavor and is not reasonably pertinent to the particular problem with which the inventor is involved. In this regard, the courts have held that "[f]or the purposes of evaluating obviousness of claimed subject matter, the particular references relied upon must constitute "analogous art". *In re Clay*, 966 F.2d 656, 659, 23 U.S.P.Q.2d 1058, 1060-61 (Fed. Cir. 1992). The art must be from the same field of endeavor, or be reasonably pertinent to the particular problem with which the inventor is involved. *Id.*

Applicants further believe that the Examiner has made the combination with hindsight provided by the present application. For example, in combining Dent with Khalid, the Examiner has selectively picked out the demodulator and the Kalman filter disclosed by Dent (from amongst several components taught by Dent as may be seen in Figure 3 of Dent) and combined them with the sensor taught by Khalid. In applying Section 103, the U.S. Court of Appeals for the Federal Circuit has consistently held that one must consider both the invention and the prior art "as a whole", not from improper hindsight gained from consideration of the claimed invention. See, *Interconnect Planning Corp. v. Feil*, 227 U.S.P.Q. 543, 551 (Fed. Cir. 1985) and cases cited therein. According to the *Interconnect* court

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> [n]ot only must the claimed invention as a whole be evaluated, but so also must the references as a whole, so that their teachings are applied in the context of their significance to a technician at the time - a technician without our knowledge of the solution.

Id.

Even if the Examiner maintains that there is motivation to combine, of which there is none, there would be no expectation of success. When a Kalman filter and a frequency demodulator are combined with a sensor, the results obtained are unexpected as shown in Figures 4 to 8. Figures 4 to 8 of the present application show how raw pressure data sensed from a pressure sensor can be used to predict the oncoming of a stall and to thereby intervene and correct or prevent the stall. Figure 5 shows frequency spectrum analysis of the raw pressure data of Figure 4 prior to the stall event. At this time, the machine was operating around 95% corrected speed (4984 Hz tip passage frequency). The precursor signals are shown at 27 and 54 Hz about the central tip passage frequency of 4984 Hz. The frequency demodulator captured these frequencies and the demodulated signal was used for post-processing by the Kalman filter. Figure 6 shows the capturing of the precursor spectrum by the demodulator. In this case, the precursor frequencies include 27, 54, and 81 Hz.

Figure 7 shows the presence of the precursor frequencies as a result of using the Kalman filter. It is the capturing of these signals by the Kalman filter that helps in the detection process. As the machine approaches the operating limit line, the magnitude of these signals increase and the Kalman filter innovation captures this phenomena leading ultimately to the detection and declaration of stall/surge. Figure 8 shows the stall measure obtained after post processing by the Kalman filter. The stall measure shows a precursor trend well ahead of the actual stall event at 107 seconds, starting as early as 80 to 85 seconds. Scaling and thresholding of the stall measure is then undertaken to display the presence of strong precursors so as to enable intervention by the control system, thereby preventing the stall/surge event from occurring.

In summary, in view of the fact that there is no motivation to combine Khalid with Dent, in view of the fact that Dent is from a non-analogous field of art, and in view of the fact that the results obtained demonstrate success where none was to be expected, the Applicants

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respectfully request a withdrawal of the § 103 rejections and an allowance of the claims.

It is believed that the foregoing remarks fully comply with the Office Action and that the claims herein should now be allowable to Applicants. Accordingly, reconsideration and allowance is requested.

If there are any additional charges with respect to this response or otherwise, please charge them to Deposit Account No. 06-1130 maintained by Cantor Colburn LLP.

Respectfully submitted,

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